

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019 SESSION

PPC 0116 – PRE-CALCULUS

(All sections / Groups)

27 MAY 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 3 pages (excluding the cover page) with 4 questions.
2. Answer all questions.
3. Unless stated otherwise, if an answer is given as a decimal, it should be rounded to **four** significant figures.
4. Write your answers in the Answer Booklet provided.
5. Show all relevant steps to obtain maximum marks.

QUESTION 1 [25 marks]

- (a) A right-angled triangle has a base of $2x+3$, a height of h and a hypotenuse of $3x$. Show that $h^2 = 5x^2 - 12x - 9$. [3 marks]

(b) Simplify $\frac{(4m^5n)^3}{(2mn^2)(8m^{10}n^3)}$. [3 marks]

(c) Solve $\frac{2-x}{\sqrt{\frac{9-6x}{4}}} = \frac{2}{3}$. [6 marks]

- (d) Solve the inequalities below. Express your answers using interval notation.

(i) $\frac{x+4}{x+5} - 1 \leq 0$ [5 marks]

(ii) $\left| \frac{2x+1}{2} \right| \geq 0$ [3 marks]

- (e) Solve the inequality below. Express your answer using set-builder notation.

$$-\frac{2}{3} < 2 - \frac{5x}{3} \leq \frac{3}{2} \quad [5 \text{ marks}]$$

Continued...

QUESTION 2 [45 marks]

- (a) Line A passes through $P_1(1, -5)$ and $P_2(x, y)$ and is perpendicular to Line B that passes through $P_3(4, 3)$ and the origin.
- (i) Find the coordinate of P_2 if $y = -1$, [2 marks]
 - (ii) Find the equation of Line B , [2 marks]
 - (iii) Determine the coordinate of the midpoint of P_2 and P_3 . [2 marks]
- (b) Suppose that $f(x) = 3x^2 + 2$,
- (i) find the average rate of change of f from $x = 1$ to $x = 3$ and from $x = 1$ to $x = 5$, [4 marks]
 - (ii) evaluate the pattern of the function f for $x > 0$. (Is the graph increasing or decreasing and what about the steepness?). [2 marks]
- (c) For the function $g(x) = \frac{x}{x-1}$ and $h(x) = \frac{3}{1+x}$, find
- (i) $(gh)(x)$ and its domain, [4 marks]
 - (ii) $h[g(x)]$ and its domain, [5 marks]
 - (iii) $(h-g)(x)$, [3 marks]
 - (iv) the inverse function of g . [3 marks]
- (d) For the equation $(x-2)^2 = 5e^{2y+5}$, find
- (i) y as a function of x , [3 marks]
 - (ii) the domain of y . [1 mark]
- (e) Sketch the graph of $f(x) = \sqrt{x}$. Use the graph of $f(x) = \sqrt{x}$ to graph $g(x) = -\sqrt{x-1} + 2$. For each stage of the transformation, state the transformation involved and sketch the corresponding graph. [8 marks]
- (f) For the function $y(x) = \frac{x+2}{x^2-9}$,
- (i) find its x - and y -intercepts, if there are any, [3 marks]
 - (ii) find the vertical and horizontal asymptotes, if there are any. [3 marks]

Continued...

QUESTION 3 [15 marks]

- (a) Find the remainder of $f(x) = 6x^4 + 5x^3 - 3x^2 - 65$ when it is divided by $x - 3$. [1 mark]
- (b) Given a function $f(x) = 2x^3 - 5x^2 - x + 3$, use synthetic division to determine whether $x + 3$ is a factor of $f(x)$. Then, use Factor Theorem to verify your answer. [6 marks]
- (c) Using Rational Zeros Theorem, list all the possible rational zeros of $f(x) = x^3 + 2x^2 - 5x - 6$. Then, verify that $x = 2$ is a zero of $f(x)$. [3 marks]
- (d) Find the partial fraction decomposition of $\frac{7x - 23}{x^2 - 8x + 15}$. [5 marks]

QUESTION 4 [15 marks]

- (a) (i) Find the expansion of $(2 + x)^5$ using the Binomial Theorem. [4 marks]
(ii) Find the coefficient of the x^3y^5 term in the expansion of $(2x - 3y)^8$ [3 marks]
- (b) Find the sum of the first 16 terms of the arithmetic sequence $\{4 - 2n\}$. [2 marks]
- (c) A chemist carried out a series of experiments which involved the use of increasing amount of titanium dioxide powder (in gram, g) that followed a geometric sequence. In the first and second experiments, 6 g and 7.8 g were used respectively.
- (i) Give a recursive formula for this sequence. [1 mark]
(ii) If a total of 1800 g of titanium dioxide available, show that N , the number of experiments possible satisfies the inequality $1.3^N \leq 91$. [3 mark]
(iii) Find the maximum number of experiments that can be performed. [2 marks]

End of paper

